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The present invention provides a cell culture medium formulation that supports the *in vitro* cultivation, particularly in suspension, of mammalian cells, particularly epithelial cells and fibroblast cells, and methods for cultivating mammalian cells in suspension *in vitro* using these media. The media comprise a basal medium and a polyanionic or polyanionic compound, preferably a polysulfonated or polysulfated compound, and more preferably dextran sulfate. The present invention also provides chemically defined, protein-free eukaryotic cell culture media comprising an iron chelate and zinc, which is capable of supporting the growth (and particularly the high-density growth of mammalian cells) in suspension culture, increasing the level of expression of recombinant protein in cultured cells, and/or increasing virus production in cultured cells.